to be accomplished, was rendered absolutely necessary by the inroads due to enlistment for military service. The first step in this direction was taken by the man power census. A brief questionnaire was sent to every botanist in America, who could be reached, and on this card each man was requested to indicate his training, degree of availability and willingness to take up emergency work in plant pathology. The replies have been most gratifying in number and tone. Teachers of botany and investigators in other fields have in considerable numbers indicated a willingness to lay aside temporarily their own investigations, investigations usually of great importance to the progress of botanical science, and take up work on the control of plant diseases.

The aim of the extension work of the committee is to make available everywhere in America information now available anywhere in America. Pathologists in various states were asked to contribute any information they might have, published or unpublished, which might be of service in other sections. Responses to this request also have been prompt and enthusiastic. Pathologists all over the country have placed in the hands of the committee for general distribution information which they have acquired in their own work and which seemed likely to be useful to other workers. They have done this frequently without waiting to insure credit to themselves by prior publication. Instead of safety first they have placed service first.

In research the effort has been to call attention to those problems which were of most pressing importance and to coordinate the work of investigators in different regions. Much has been accomplished here in so arranging work that the efforts of one investigator should supplement rather than duplicate those of his neighbor.

The results of these lines of effort can not fail to be of great service. Undoubtedly the greatest immediate gain will come from the extension work, from the distribution of information to the plant pathologists of every state in the union and the further distribution of this information through the county agents and the farm demonstrators to the actual producers. It is highly probable, however, that the greatest ultimate good to plant pathology as a science and to the nation will come from the temporary enlistment of a large number of botanists from other lines. This increase is not a gain in numbers merely but a gain in different technical training, different methods of work, new points of view. So close are the interrelations of the natural sciences that striking contributions to a science are frequently made by a newcomer in the field who has been well trained in another not too closely related field. Thus it is only natural to expect that from the present mobilization of botanists of all kinds in plant pathology will come striking and valuable contributions to that science.

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## A SURVEY OF HIGH-SCHOOL CHEMISTRY IN PENNSYLVANIA

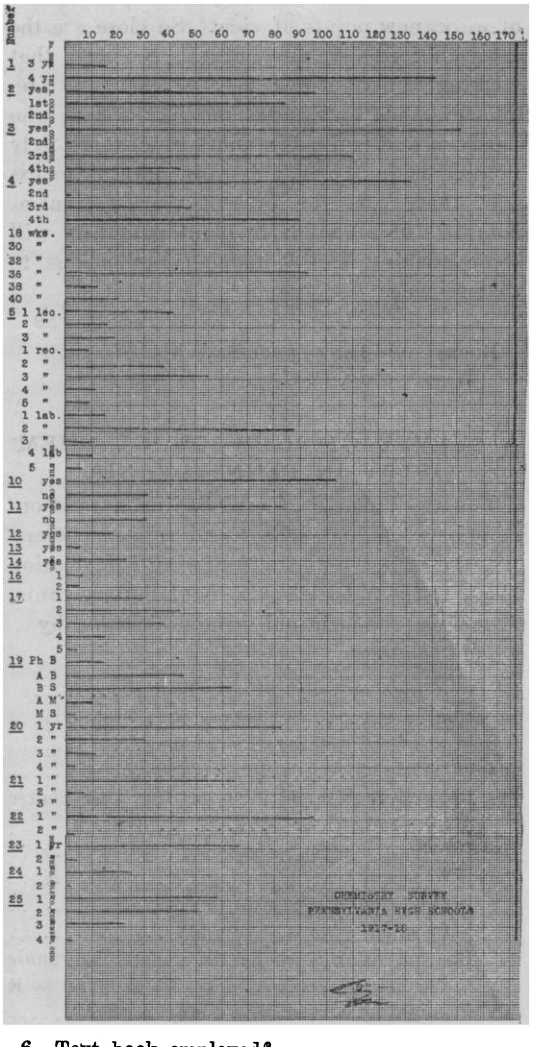
FOR the purpose of establishing a relationship between high-school and college chemistry, the writer sent the following information blank to the 971 high schools of Pennsylvania, following the original communication by a second request.

Name of high or preparatory school .....
Location ..... St., City ..... State .....
Name of officer making this report .....
Official Title .....

1. Do you require a three- or four-year course for graduation: ..... year.
2. Do you give a course in general science?.....
   In which year is it taught? .....
3. Do you give a course in physics?.....
   In which year is it taught? .....
*4. Do you offer a course in general inorganic chemistry? ..... In which year is it taught? ..... How many weeks? .....
   How many pupils take the course? .....
5. How many lecture periods per week? .....
   Length of period? .....
   How many recitation periods per week?....
   Length of period? .....
   How many laboratory periods per week?....

* If you offer more than one couse, furnish statistics for the one considered your college preparatory course and mention the other under 14.

Length of period? .....
How many pupils in a recitation section? ..... In a laboratory section? .....
How many recitation sections? .....
How many laboratory sections? .....
How many pupils per instructor in laboratory sections? .....



6. Text book employed? .....
7. Laboratory manual employed? .....
   Do you omit any of the experiments? .....
   Which ones? .....
8. Chemical elements studied in course? (Cross out those not studied.) O, H, N, Cl, C, S, F, Br, I, P, B, As, Si, Sb, Bi, Na, K, Ba, Sr, Ca, Cu, Ag, Au, Mg, Zn, Cd, Hg, Al, Sn, Pb, Cr, Mn, Fe, Co, Ni, Ra.
   Do you include any not listed above? .....
9. Which of the following do you include? (Cross out any not included.) Dalton's atomic theory, law of constant proportions, combining weights, valence, Boyle's law, kinetic molecular hypothesis, Avogardo's law, Gay-Lussac's law, catalytic agent, allotropism, osmotic pressure, freezing and boiling point effects, gram molecular volume law, DuLong and Petit's law, periodic arrangement of elements, Mosely numbers, electron theory, structure of atom, ionization, Faraday's law, equilibrium, thermal equation, colloids.
   Mention laws or theories taught and not included in above list .....
10. Do you think that it is an advantage to have physics precede chemistry? .....
11. Do you consider it wise to postpone chemistry to the fourth year, giving physics in the third, and mathematics during all four? .. .....
12. Do you offer a course in qualitative analysis? ..... Nature and scope of work? ..... ..... ..... Text book? .....
13. Do you offer a course in organic chemistry? ..... Nature and scope of work? ..... Text book? ..... .....
14. Do you offer any other courses in chemistry? ..... Nature and scope? ..... ..... ..... .....Text book? ..... .....
15. (*a*) How many hours do you lecture personally per week? .....
    (*b*) How many hours of recitation do you conduct personally per week? .....
    (*c*) How many hours of laboratory work do you give personally per week? ..... .....
16. If you have assistants how many and in which part of the work? .....
17. Do you teach any subjects other than chemistry? If so mention the subjects and number of hours per week? ..... ..... .....
18. Colleges or universities which you have attended ..... .....

.....

19. Degrees and when obtained? .....

.....

20. Did you study inorganic chemistry in college? ..... How many years? .....
21. Did you study quantitative analysis? ..... How many years? .....
22. Did you study qualitative analysis? ..... How many years? .....
23. Did you study organic chemistry? ..... How many years? .....
24. Did you study physical chemistry? ..... How many years? .....
25. Did you study physics? ..... How many years? .....

TABLE I

*Number of Pupils taking College Preparatory Course in General Chemistry*

| Number of Pupils | Number of Schools | Number of Pupils | Number of Schools | Number of Pupils | Number of Schools |
|---|---|---|---|---|---|
| 3 | 1 | 20 | 7 | 41 | 1 |
| 4 | 1 | 21 | 6 | 45 | 4 |
| 6 | 4 | 22 | 4 | 47 | 1 |
| 7 | 3 | 23 | 2 | 49 | 1 |
| 8 | 2 | 24 | 1 | 50 | 3 |
| 9 | 2 | 25 | 4 | 52 | 1 |
| 10 | 3 | 26 | 2 | 56 | 1 |
| 11 | 4 | 28 | 3 | 60 | 3 |
| 12 | 9 | 30 | 5 | 62 | 1 |
| 13 | 2 | 31 | 1 | 65 | 1 |
| 14 | 6 | 33 | 1 | 70 | 1 |
| 15 | 5 | 35 | 3 | 75 | 3 |
| 16 | 8 | 36 | 1 | 76 | 1 |
| 17 | 1 | 37 | 1 | 150 | 2 |
| 18 | 2 | 38 | 2 | 160 | 1 |
| 19 | 1 | 40 | 1 | 175 | 1 |

TABLE II

*Number of Pupils Per Recitation Section*

| Number of Pupils | Number of Schools | Number of Pupils | Number of Schools | Number of Pupils | Number of Schools |
|---|---|---|---|---|---|
| 3 | 1 | 13 | 3 | 23 | 3 |
| 4 | 2 | 14 | 8 | 24 | 3 |
| 6 | 4 | 15 | 5 | 25 | 12 |
| 7 | 4 | 16 | 12 | 26 | 2 |
| 8 | 3 | 17 | 4 | 28 | 1 |
| 9 | 4 | 18 | 8 | 30 | 6 |
| 10 | 4 | 19 | 4 | 33 | 1 |
| 11 | 4 | 20 | 15 | 35 | 2 |
| 12 | 5 | 21 | 6 | 36 | 1 |
| | | 22 | 3 | 104 | 1 |

Answers to questions 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 16, 17, 19, 20, 21, 22, 23, 24 and 25 received from 150 of the 172 high schools from which replies came are answered graphically, wholly or in part, on the accompanying chart. The remaining 22 schools do not teach chemistry.

In reply to the last question under No. 4 data shown in Table I. were obtained.

TABLE III

*Number of Pupils Per Laboratory Section*

| Number of Pupils | Number of Schools | Number of Pupils | Number of Schools | Number of Pupils | Number of Schools |
|---|---|---|---|---|---|
| 2 | 1 | 12 | 9 | 21 | 5 |
| 3 | 1 | 13 | 3 | 22 | 4 |
| 4 | 2 | 14 | 6 | 23 | 2 |
| 6 | 5 | 15 | 6 | 24 | 3 |
| 7 | 6 | 16 | 10 | 25 | 10 |
| 8 | 8 | 17 | 4 | 26 | 2 |
| 9 | 5 | 18 | 7 | 30 | 12 |
| 10 | 7 | 19 | 2 | 33 | 1 |
| 11 | 4 | 20 | 11 | 35 | 1 |

Answers to 5 (*d*) are given in Tables II. and III.

Answering question 6 the following information was given regarding text-books in use.

Avery—2
Blanchard & Wade—11
Bradbury—1
Brownlee and others—52
Cook—1
Fuller—19
Green & Keller—1
Godfrey—1
Gunnison—1
Hessler & Smith—1
Hitchcock—1
Morgan & Lyman—4
McPherson & Henderson—31
Newell—22
Remsen—2
Smith—1
Weed—2
Williams—1

Answering question 7 the following information was given concerning laboratory manuals.

A. H. S. Manual—1
Brownlee—31
Dennis & Clark—4
Cook—1
Fuller—9
Godfrey—2
Knott—3
Morgan & Lyman—5
McFarland—1
McPherson & Henderson—24
Newell—18
Remsen—1
Smith—1
Weed—2
White—1
Whitman—6
Williams—5

From answers to question 8 it was ascertained that the following elements, of those listed, are omitted from courses given in the number of schools indicated.

| | | | |
|---|---|---|---|
| Antimony | 17 | Gold | 16 |
| Arsenic | 13 | Iodine | 3 |
| Barium | 10 | Manganese | 7 |
| Bismuth | 22 | Nickel | 12 |
| Boron | 18 | Phosphorus | 2 |
| Bromine | 4 | Radium | 49 |
| Cadmium | 32 | Silicon | 11 |
| Chromium | 16 | Strontium | 27 |
| Cobalt | 13 | Tin | 5 |
| Fluorine | 10 | | |

In answer to question 9 it was found that the following theories, laws and principles are omitted by the number of schools indicated.

Law of constant proportions—3, combining weights—2, Boyle's law—2, kinetic molecular hypothesis—26, Avogadro's law—3, Gay-Lussac's law—5, catalytic agent—3, allotropism—16, osmotic pressure—21, freezing and boiling point effects—7, gram molecular volume law—21, Du-Long and Petit's law—51, periodic arrangement of elements—15, Moseley numbers—99, electron theory—19, structure of atom—27, ionization—2, Faraday's law—25, equilibrium—8, thermal equation—45, colloids—45.

Question 15 is answered in Tables IV., *A*, *B* and *C*.

TABLE IV

(*a*) *Number of Lectures per Week per Instructor*

| Number of Lectures | Number of Schools | Number of Lectures | Number of Schools | Number of Lectures | Number of Schools |
|---|---|---|---|---|---|
| 1 | 25 | 4 | 3 | 6 | 2 |
| 2 | 9 | 5 | 2 | 7 | 2 |
| 3 | 7 | | | 8 | 2 |

(*b*) *Number of Recitations per Week per Instructor*

| Number of Recitations | Number of Schools | Number of Recitations | Number of Schools | Number of Recitations | Number of Schools |
|---|---|---|---|---|---|
| 1 | 17 | 7 | 2 | 16 | 1 |
| 2 | 24 | 8 | 6 | 18 | 1 |
| 3 | 24 | 9 | 2 | 20 | 1 |
| 4 | 16 | 12 | 6 | 21 | 1 |
| 5 | 6 | 14 | 3 | 25 | 1 |
| 6 | 3 | 15 | 3 | 26 | 1 |

With reference to question 18 it is gratifying to note that most of the science teachers in high schools are graduates of reputable colleges and universities. The writer has a list showing the number from each institution. This list is available for any one who may be interested. It would seem unnecessary to include the institutions here, because of the large amount of space required for the purpose. Seventy-four institutions are included in the list already compiled.

(*c*) *Number of Hours of Laboratory per Week per Instructor*

| Number of Lab. Hours | Number of Schools | Number of Lab. Hours | Number of Schools | Number of Lab. Hours | Number of Schools |
|---|---|---|---|---|---|
| 1 | 11 | 6 | 6 | 12 | 5 |
| 2 | 22 | 7 | 1 | 14 | 1 |
| 3 | 21 | 8 | 7 | 15 | 3 |
| 4 | 11 | 10 | 6 | 16 | 3 |
| 5 | 7 | | | 17 | 1 |

It is evident from the variety of answers already received that standardization is necessary. For this purpose the state should have a permanent committee, as long as the United States Commissioner of Education is not empowered to establish standards and enforce them. The latter procedure is naturally more desirable, as it would enable all colleges and universities to plan their courses as continuation courses instead of repeating much of the material which students in some high schools have already covered.

The writer wishes to acknowledge valuable assistance rendered by Miss Marcella Schwer.

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## TWENTY-FIVE IMPORTANT TOPICS IN THE HISTORY OF SECONDARY MATHEMATICS

The rapid increase in the number of the historical notes in our recent text-books on elementary and secondary mathematics raises the question, What should be the dominating motive in the selection of such notes? The history of mathematics is so enormous that it is clearly impossible to present a considerable part of it in such notes, but it would be possible to select for them some of the central elements of this history, which might become